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(54) A multiband antenna system

(57) There is described a multiband antenna system for operating at L-band, S-band and UHF-band comprising L-band antenna elements (1) and S-band antenna elements (2) provided in the form of quadrifilar helices spaced from each other on the surface of a hollow cylindrical insulator (4); UHF band antenna elements (3) provided in the form of a cage dipole on the surface of the said hollow cylindrical insulator (4); the L-band antenna input being connected to a first connector (5) through an L-band feed network card (8); the S-band antenna input being connected to a second connector (6) through an S-band feed network card (9) and the UHF-band antenna input being connected to a third connector (7) through a split sheath balun (10) provided along the axis of the said hollow cylindrical insulator (4).

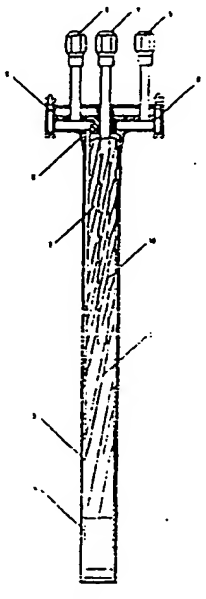

FIG. 1

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Description

The invention relates to a multiband antenna system for operating at L-band, S-band and UHF band. It is very useful in personal communication hand held sets for satellite or cellular phone system.

The antenna system according to the invention makes it possible to construct a composite antenna with relatively small dimensions. It is possible to construct the multiband antenna system according to the invention with dimensions within 10mm diameter and 180mm length. The antenna elements of L-band and S-band are quadrifilar helices fed in equal amplitude and quadrature phase to obtain an almost hemispherical coverage. The feed network of the antenna system is specially designed to achieve optimum results. The necessary amplitude and phase are obtained without the use of any external hybrid. The antenna element of UHF-band is a cage dipole providing a toroidal pattern.

The entire antenna system is light and is preferably enclosed in a radome. Standard interface connections such as SMA connectors are used for interface connections.

Thus the invention provides a multiband antenna system for operating at L-band, S-band and UHF-band comprising L-band antenna elements and S-band antenna elements provided in the form of quadrifilar helices spaced from each other on the surface of a hollow cylindrical insulator; UHF-band antenna elements provided in the form of a cage dipole on the surface of the said hollow cylindrical insulator; the L-band antenna input being connected to a first connector through an L-band feed network card; the S-band antenna input being connected to a second connector through an S-band feed network card and the UHF-band antenna input being connected to a third connector through a split sheath balun provided along the axis of the said hollow cylindrical insulator.

The multiband antenna system according to the invention will now be explained further with reference to the accompanying drawings in which :

Fig. 1 shows the multiband antenna system according to the invention.

Fig 2 shows the antenna elements spread on a flat insulator which is made into a hollow cylindrical insulator with antenna elements in quadrifilar helices.

Fig 3 shows the L-band feed network card used according to the invention.

Fig 4 shows the S-band feed network card used according to the invention.

Fig 5 shows the antenna with cylindrical feed network.

The L-band antenna elements (1), the S-band antenna elements (2) and the UHF antenna elements (3) are provided on an insulator sheet such as kapton by photo etching. Then it is rolled into a hollow cylindrical insulator (4) forming quadrifilar helices of L-band and S-band antenna elements and a caged dipole of UHF-band antenna elements. The L-band antenna input is connected to a first connector (5) through an L-band feed network card (8). The S-band antenna input is connected to a second connector (6) through an S-band feed network card (9). The UHF-antenna input is connected to a third connector (7) through a split sheath balun (10) located along the axis of the said hollow cylindrical insulator (4).

The L-band and S-band antenna elements (1,2) are terminated on the respective feed network card (8,9). The feeding terminals of the feed network card are connected to connectors (5,6) through cables preferably semi rigid cables. The split sheath balun is also connected to connector (7) for feeding UHF signal. The entire antenna assembly is preferably enclosed in a radome (11). The multiband antenna system developed is a total new development in dimensions of 10mm dia, for the frequencies given with a unique feed network for L,S multifilar radiators.

In a preferred embodiment of the antenna the L&S-band radiation coverage is almost hemispherical, circularly polarized with axial ratio – 2dB and peak gain 2.8 dB ± 0.2dB, return loss better than 15 dB over ± 15 MHz band. The antenna does not require a separate ground plane. The dipole radiation pattern is toroidal in shape with linear polarization and a peak gain of 2dBi.

A preferred embodiment of the antenna according to the invention comprises a feed network having a cylindrical form as close in a diameter as possible to the actual antenna structure as shown in fig. 5. This network is a vertical feed network system. The feed networks (14,15) required for the up-link frequencies and down-link frequencies are made out of a thin substrate and wrapped over the interior and exterior of a hollow cylindrical brass adaptor (13) respectively. The final connections are taken out using a coaxial flexible cable (12) with suitable connector. Depending upon the frequency of use and the type of pattern desired, the length of the antenna may be varied with a maximum of around 150 mm. The diameter of the antenna remain as 10 mm. Provision for sliding the antenna into a handset is also provided.

One of the main applications of this antenna system is in personal hand held set for LEO/ICO/GEO satellite communication. They are also very useful as space craft TTC antennas and for beacon application. They can also be used very effectively in buoys, ship terminals, cellular radio telephones, walkie-talkies etc.

Using the same technique antenna for L-band and S-band can be separately produced or a combined L,S without UHF can be also produced. The length gets reduced in the range of 90mm to 135mm depending upon frequency and helix geometry in the same diameter of 10mm. By frequency scaling the antenna can be produced for other frequencies also.

Claims

1. A multiband antenna system for operating at L-band, S-band and UHF-band comprising L-band antenna elements (1) and S-band antenna elements (2) provided in the form of quadrifilar helices spaced from each other on the surface of a hollow cylindrical insulator (4); UHF band antenna elements (3) provided in the form of a cage dipole on the surface of the said hollow cylindrical insulator (4); the L-band antenna input being connected to a first connector (5) through an L-band feed network card (8); the S-band antenna input being connected to a second connector (6) through an S-band feed network card (9) and the UHF-band antenna input being connected to a third connector (7) through a split sheath balun (10) provided along the axis of the said hollow cylindrical insulator (4).

2. The multiband antenna system as claimed in claim 1 wherein the said antenna elements and the said feed networks are enclosed in a radome.

3. The multiband antenna system as claimed in claim 1 wherein the L-band, S-band and UHF-band antenna inputs are connected to first, second and third connectors respectively by means of semi rigid coaxial cables.

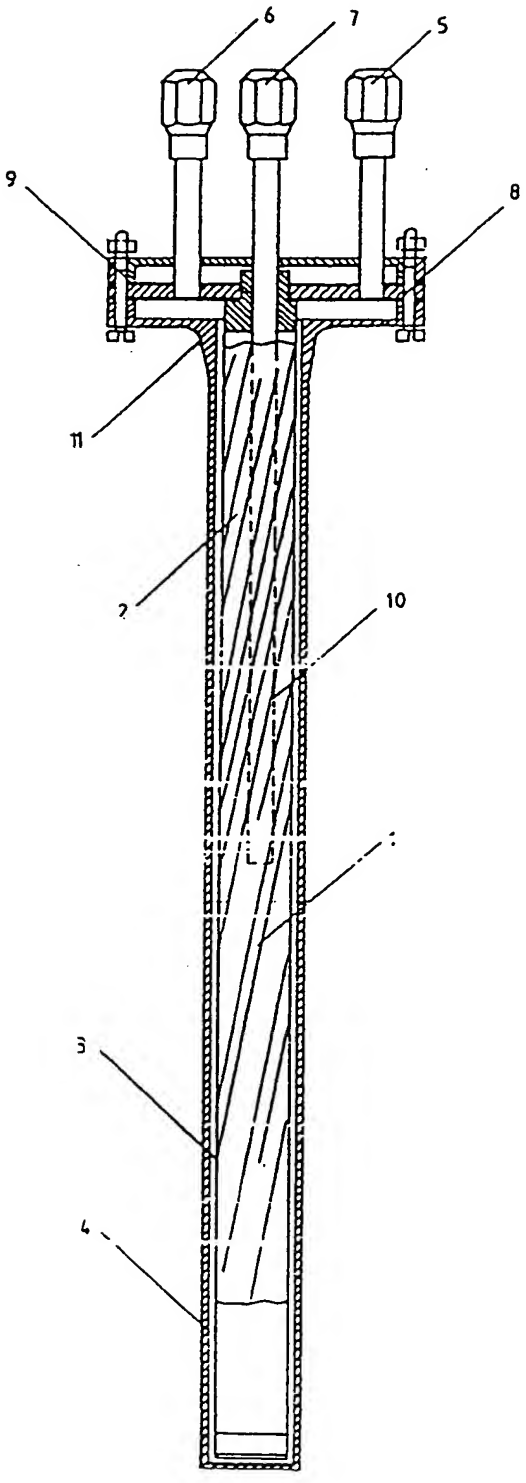

FIG - 1

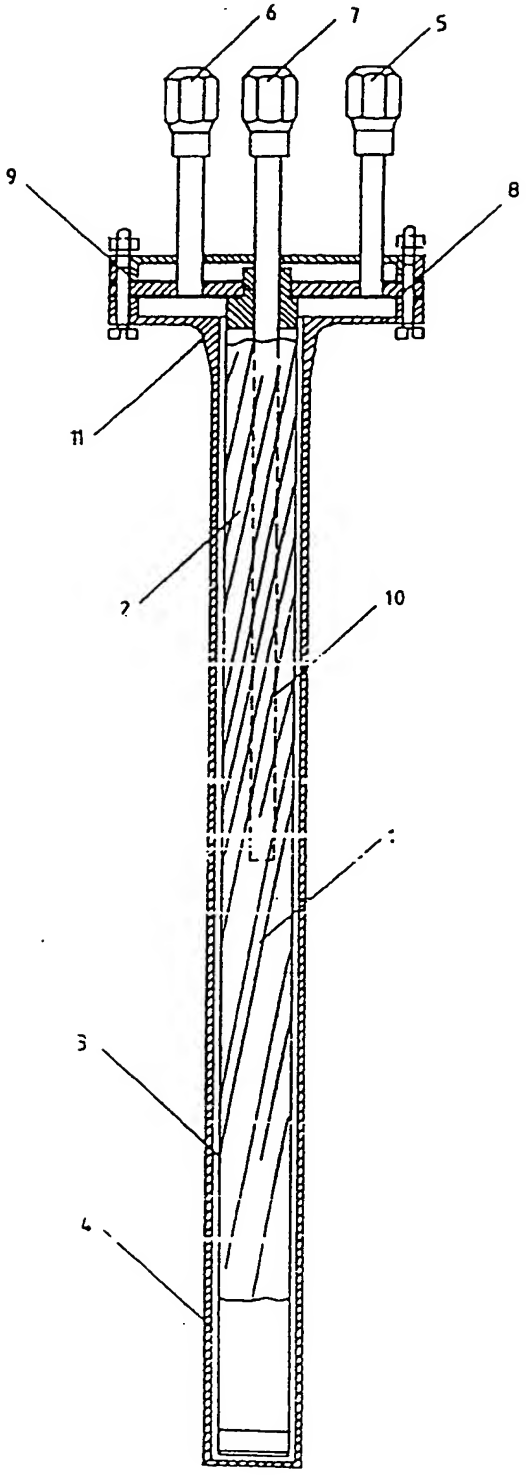

FIG - 1

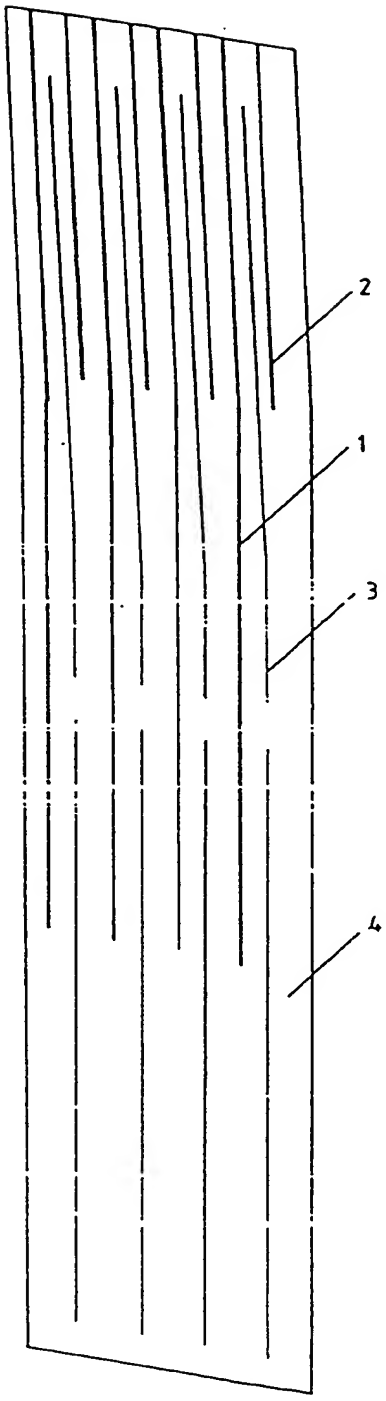

FIG - 2

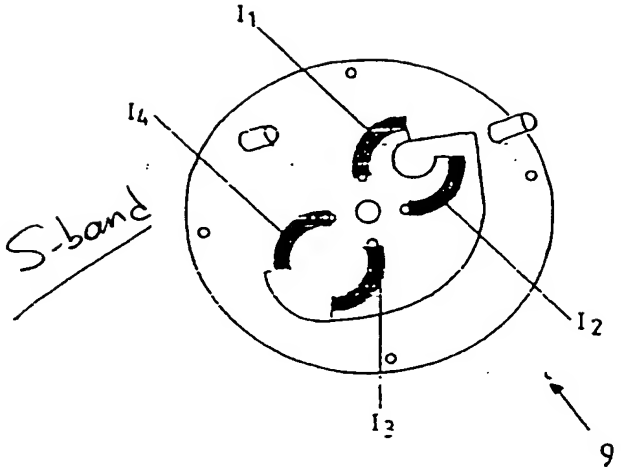

FIG - 4

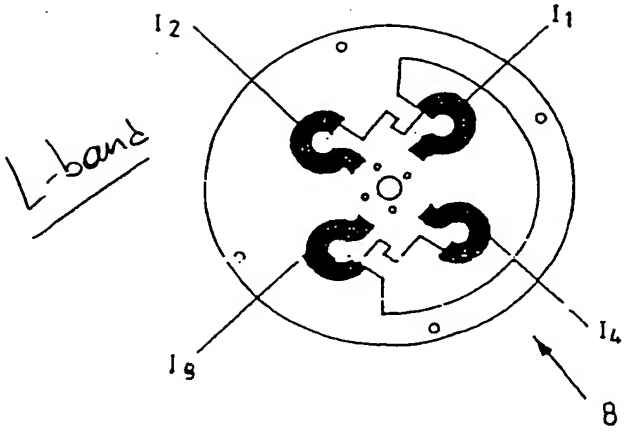

FIG - 3

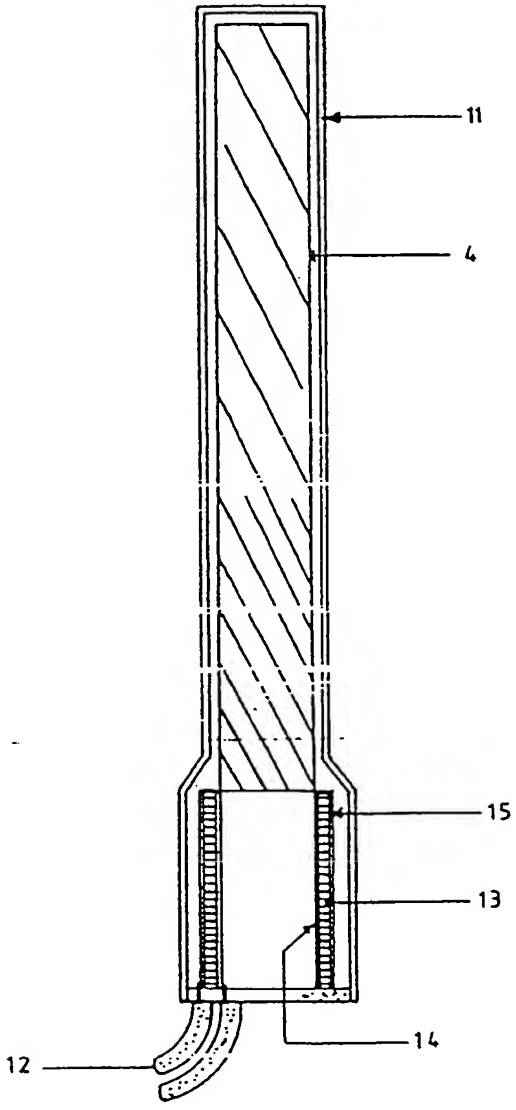

FIG - 5

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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 8939

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 16 no. 403 (E-1254) ,26 August 1992 & JP-A-04 134906 (NIPPON TELEGR & TELEPH) * abstract *	1,3	H01Q11/08 H01Q5/00
A	FR-A-2 667 988 (LE CENTRE THOMSON D'APPLICATIONS RADARS LCTAR) * abstract; figures 1-6 *	1,3	
A	FR-A-2 570 546 (AGENCE SPATIALE EUROPEENNE) * claims 1-6; figures 1-3 *	1,3	
A	DE-A-30 17 169 (TADIRAN ISRAEL ELECTRONICS INDUSTRIES) * page 7, last paragraph - page 8; figure 2 *	1	
A	EP-A-0 427 654 (ETAT FRANCAIS REPRESENTE PAR LE MINISTRE DES PTT) * page 3, line 28 - line 57; figures 1-4 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US-A-5 138 331 (JOSYPENKO) * claims 1,2; figures 1-5 *	1	H01Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 April 1995	Angrabeit, F

CATEGORY OF CITED DOCUMENTS

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